

## Response to Restriction Requirement and Species Election

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Applicant(s): BENZ et al.

Serial No.: 10/663,926

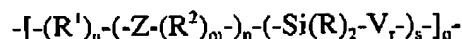
Confirmation No.: 2299

Filed: September 16, 2003

For: COMPOUNDS CONTAINING QUATERNARY CARBONS AND SILICON-CONTAINING GROUPS.  
MEDICAL DEVICES, AND METHODS

CLAIMS READABLE ON THE ELECTED SPECIES

1. A medical device comprising a polymer comprising a group of the formula:



wherein:

n = 0 or 1;

m = 0 or 1;

p = 1-100,000;

r = 0-100,000;

s = 1-100,000;

q = 1-100,000;

R<sup>1</sup> and R<sup>2</sup> are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

Z is -C(R<sup>3</sup>)<sub>2</sub>- wherein each R<sup>3</sup> is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two R<sup>3</sup> groups within -C(R<sup>3</sup>)<sub>2</sub>- can be optionally joined to form a ring;

each R is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms; and

V is -O-Si(R)<sub>2</sub>- or R<sup>1</sup>.

2. The medical device of claim 1 wherein p = 1-5000.
3. The medical device of claim 2 wherein p = 2-12.
4. The medical device of claim 1 wherein R<sup>1</sup> and R<sup>2</sup> are each independently a straight chain alkylene group, an arylene group, or combinations thereof.

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5. The medical device of claim 4 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group.
6. The medical device of claim 1 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 100 carbon atoms.
7. The medical device of claim 6 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 20 carbon atoms.
8. The medical device of claim 7 wherein  $R^1$  and  $R^2$  are each independently groups containing 2 to 20 carbon atoms.
9. The medical device of claim 1 wherein each  $R^3$  is independently a straight chain alkyl group, an aryl group, or combinations thereof, optionally including heteroatoms.
10. The medical device of claim 9 wherein each  $R^3$  is independently a straight chain alkyl group, optionally including heteroatoms.
11. The medical device of claim 10 wherein each  $R^3$  is independently a straight chain alkyl group containing 1 to 20 carbon atoms.
12. The medical device of claim 1 wherein the polymer further comprises a urethane group, a urea group, or combinations thereof.
13. The medical device of claim 12 wherein the polymer comprises a segmented polyurethane.
14. The medical device of claim 1 wherein the polymer is a biomaterial.

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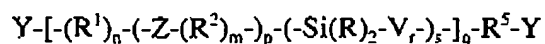
For: COMPOUNDS CONTAINING QUATERNARY CARBONS AND SILICON-CONTAINING GROUPS,  
MEDICAL DEVICES, AND METHODS

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15. The medical device of claim 14 wherein the polymer is substantially free of ether, ester, and carbonate linkages.

16. The medical device of claim 1 wherein the polymer is linear, branched, or crosslinked.

17. A medical device comprising a polymer prepared from a compound of the formula:



wherein:

each Y is independently OH or  $NR^4H$ ;

$n = 0$  or  $1$ ;

$m = 0$  or  $1$ ;

$p = 1-100,000$ ;

$r = 0-100,000$ ;

$s = 1-100,000$ ;

$q = 1-100,000$ ;

$R^1$ ,  $R^2$ , and  $R^5$  are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

Z is  $-C(R^3)_2-$  wherein each  $R^3$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two  $R^3$  groups within  $-C(R^3)_2-$  can be optionally joined to form a ring;

each R is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

each  $R^4$  is independently H or a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof; and

V is  $-O-Si(R)_2-$  or  $R^1$ .

18. The medical device of claim 17 wherein  $p = 1-100$ .

19. The medical device of claim 18 wherein  $p = 2-12$ .

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20. The medical device of claim 17 wherein the number average molecular weight of the compound of the formula  $Y-[-(R^1)_n-(-Z-(R^2)_m-)_p-(-Si(R)_2-V_r-)_s-]_q-R^5-Y$  is no greater than about 100,000 grams/mole.
21. The medical device of claim 20 wherein the number average molecular weight of the compound of the formula  $Y-[-(R^1)_n-(-Z-(R^2)_m-)_p-(-Si(R)_2-V_r-)_s-]_q-R^5-Y$  is about 1000 grams/mole to about 1500 grams/mole.
22. The medical device of claim 17 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group, an arylene group, or combinations thereof.
23. The medical device of claim 22 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group.
24. The medical device of claim 17 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 100 carbon atoms.
25. The medical device of claim 24 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 20 carbon atoms.
26. The medical device of claim 25 wherein  $R^1$  and  $R^2$  are each independently groups containing 2 to 20 carbon atoms.
27. The medical device of claim 17 wherein each  $R^2$  includes at least two carbon atoms.
28. The medical device of claim 17 wherein each  $R^3$  is independently a straight chain alkyl group, an aryl group, or combinations thereof, optionally including heteroatoms.
29. The medical device of claim 28 wherein each  $R^3$  is independently a straight chain alkyl group, optionally including heteroatoms.

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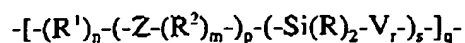
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30. The medical device of claim 29 wherein each  $R^3$  is independently a straight chain alkyl group containing 1 to 20 carbon atoms.
31. The medical device of claim 17 wherein the polymer further comprises a urethane group, a urea group, or combinations thereof.
32. The medical device of claim 31 wherein the polymer comprises a segmented polyurethane.
33. The medical device of claim 17 wherein the polymer is a biomaterial.
34. The medical device of claim 33 wherein the polymer is substantially free of ether, ester, and carbonate linkages.
35. The medical device of claim 17 wherein each Y is OH.
36. The medical device of claim 17 wherein each  $R^4$  is independently H or a straight chain alkyl group.
37. The medical device of claim 36 wherein each  $R^4$  is independently a straight chain alkyl group containing 1 to 20 carbon atoms.
38. The medical device of claim 36 wherein each  $R^4$  is H.
39. The medical device of claim 17 wherein the polymer is linear, branched, or crosslinked.
40. A polymer comprising a group of the formula:



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wherein:

 $n = 0 \text{ or } 1;$  $m = 0 \text{ or } 1;$  $p = 1-100,000;$  $r = 0-100,000;$  $s = 1-100,000;$  $q = 1-100,000;$  $R^1$  and  $R^2$  are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms; $Z$  is  $-C(R^3)_2-$  wherein each  $R^3$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two  $R^3$  groups within  $-C(R^3)_2-$  can be optionally joined to form a ring;each  $R$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms; and $V$  is  $-O-Si(R)_2-$  or  $R^1$ .

41. The polymer of claim 40 wherein  $p = 1-5000$ .
42. The polymer of claim 40 wherein  $p = 2-12$ .
43. The polymer of claim 40 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group, an arylene group, or combinations thereof.
44. The polymer of claim 43 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group.
45. The polymer of claim 40 wherein  $R^1$  and  $R^2$  are each independently groups containing 2 to 20 carbon atoms.

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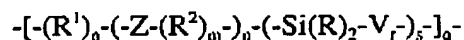
46. The polymer of claim 40 wherein each  $R^3$  is independently a straight chain alkyl group, an aryl group, or combinations thereof, optionally including heteroatoms.

47. The polymer of claim 46 wherein each  $R^3$  is independently a straight chain alkyl group, optionally including heteroatoms.

48. The polymer of claim 47 wherein each  $R^3$  is independently a straight chain alkyl group containing 1 to 20 carbon atoms.

49. The polymer of claim 40 which is linear, branched, or crosslinked.

50. A polymer comprising a urethane group, a urea group, or combinations thereof, and a group of the formula:



wherein:

$n = 0$  or  $1$ ;

$m = 0$  or  $1$ ;

$p = 1-100,000$ ;

$r = 0-100,000$ ;

$s = 1-100,000$ ;

$q = 1-100,000$ ;

$R^1$  and  $R^2$  are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

$Z$  is  $-C(R^3)_2-$  wherein each  $R^3$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two  $R^3$  groups within  $-C(R^3)_2-$  can be optionally joined to form a ring;

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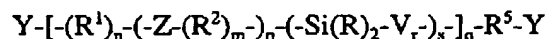
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each R is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms; and

V is  $-\text{O}-\text{Si}(\text{R})_2-$  or  $\text{R}^1$ .

51. The polymer of claim 50 wherein  $p = 1-100$ .
52. The polymer of claim 51 wherein  $p = 2-12$ .
53. The polymer of claim 50 which is a segmented polyurethane.
54. The polymer of claim 50 which is a biomaterial.
55. The polymer of claim 54 which is substantially free of ether, ester, and carbonate linkages.
56. The polymer of claim 50 which is linear, branched, or crosslinked.
57. A polymer prepared from a compound of the formula:



wherein:

each Y is independently OH or  $\text{NR}^4\text{H}$ ;

$n = 0$  or  $1$ ;

$m = 0$  or  $1$ ;

$p = 1-100,000$ ;

$r = 0-100,000$ ;

$s = 1-100,000$ ;

$q = 1-100,000$ ;



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$R^1$ ,  $R^2$ , and  $R^5$  are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

Z is  $-C(R^3)_2-$  wherein each  $R^3$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two  $R^3$  groups within  $-C(R^3)_2-$  can be optionally joined to form a ring;

each R is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

each  $R^4$  is independently H or a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof; and

V is  $-O-Si(R)_2-$  or  $R^1$ .

58. The polymer of claim 57 wherein  $p = 1-100$ .

59. The polymer of claim 58 wherein  $p = 2-12$ .

60. The polymer of claim 57 wherein the number average molecular weight of the compound of the formula  $Y-[-(R^1)_n-(-Z-(R^2)_m)_p-(-Si(R)_2-V)_q-R^5-Y]$  is no greater than about 100,000 grams/mole.

61. The polymer of claim 57 wherein  $R^1$  and  $R^2$  are each independently a straight chain alkylene group, an arylene group, or combinations thereof.

62. The polymer of claim 61 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 100 carbon atoms.

63. The polymer of claim 62 wherein  $R^1$  and  $R^2$  are each independently groups containing up to 20 carbon atoms.

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64. The polymer of claim 63 wherein  $R^1$  and  $R^2$  are each independently groups containing 2 to 20 carbon atoms.

65. The polymer of claim 57 wherein each  $R^2$  includes at least two carbon atoms.

66. The polymer of claim 57 wherein each  $R^3$  is independently a straight chain alkyl group, an aryl group, or combinations thereof, optionally including heteroatoms.

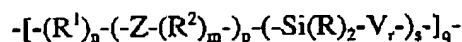
67. The polymer of claim 66 wherein each  $R^3$  is independently a straight chain alkyl group containing 1 to 20 carbon atoms.

68. The polymer of claim 57 wherein each Y is OH.

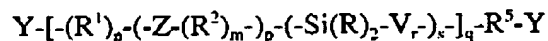
69. The polymer of claim 57 wherein each  $R^4$  is independently H or a straight chain alkyl group.

70. The polymer of claim 57 which is linear, branched, or crosslinked.

76. A method of making a polymer comprising a group of the formula



the method comprising combining an organic compound containing two or more groups capable of reacting with hydroxyl or amine groups with a polymeric starting compound of the formula:



wherein:

each Y is independently OH or  $NR^4H$ ;

$n = 0$  or  $1$ ;

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 $m = 0 \text{ or } 1;$  $p = 1-100,000;$  $r = 0-100,000;$  $s = 1-100,000;$  $q = 1-100,000;$ 

$R^1$ ,  $R^2$ , and  $R^5$  are each independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

$Z$  is  $-C(R^3)_2-$  wherein each  $R^3$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms, wherein the two  $R^3$  groups within  $-C(R^3)_2-$  can be optionally joined to form a ring;

each  $R$  is independently a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof, optionally including heteroatoms;

each  $R^4$  is independently H or a saturated or unsaturated aliphatic group, an aromatic group, or combinations thereof; and

$V$  is  $-O-Si(R)_2-$  or  $R^1$ .